TeleMed: A Working Distributed Virtual Patient Record System

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TeleMed[1] is a distributed diagnosis and analysis system, which permits physicians who are not collocated to consult on the status of a patient. The patient's record is dynamically constructed from data that may reside at several sites but which can be quickly assembled for viewing by pointing to the patient's name. Then, a graphical patient record appears, through which consulting physicians can retrieve textual and radiographic data with a single mouse click.

Specification and development of TeleMed was a joint effort between scientists at Los Alamos National Laboratory (LANL) and physicians at the National Jewish Center for Immunology and Respiratory Medicine (NJC). The TeleMed system enables physicians who are geographically remote to simultaneously see, edit and annotate a common patient record. It handles multimedia data including CT imaging and audio annotations. It uses Object Request Brokers (ORBs) which abstract the distributed databases that provide the persistent object storage of the multimedia data. It is built with the idea of providing easy-to-use access to complex information while providing advanced data-mining techniques accessible to an end user.

Protecting patient confidentiality is of paramount importance in TeleMed. Also important is protection against unauthorized modifications of patient data. The security infrastructure layer of TeleMed is intended to provide the security services necessary to allow access control for patient data. This includes two fundamental services: an authentication framework and secure remote method calls. Any particular access control policy is implemented at a higher level, using an application-specific authorization object and access control lists.

TeleMed has been deployed at the NJC, the National Institutes of Health, and at the Texas Medical Center for early testing and evaluation. Physicians at these three institutions can simultaneously view, edit, and annotate the patient data stored at multiple locations while each physician can see the data the other physician has entered. To the physician using TeleMed, it appears as if all the data resides on their own desktop computer; there is no indication that multiple databases are involved. We have also implemented, where the available bandwidth permits, the ability to support video teleconferencing within the TeleMed system.

A patient's treatment record appears by double-clicking on the patient's name in the initial TeleMed interface. The user interface manifestation of all the patient's data, gleaned from all relevant locations, is called a Graphical Patient Record (GPR) and is shown in Figure 1. The GPR is an excellent example of media-rich document and distributed object technology. The GPR is a virtual document, a patient record that is empty until it is dynamically populated by requests for distributed objects. Persistent patient objects contain the information necessary for "harvesting" the data from all appropriate sites. Thus, laboratory reports may be retrieved from the National Institutes of Health in Bethesda, MD while radiographic data may reside at the NJC in Denver. Then, when all patient data are retrieved, icons representing laboratory tests, radiographic studies, drug
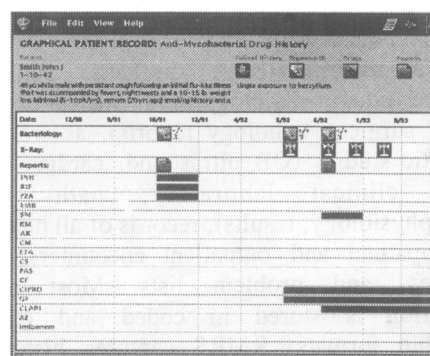

Figure 1 - TeleMed Graphical Patient Record treatments, etc. are drawn on the GPR template.

Each of these icons is mouse-sensitive and, when clicked, call up additional user interfaces and related data. These interfaces will be extensively demonstrated in the proposed electronic exhibit. While not essential, the availability of a T1 line would allow for the most realistic demonstration.

TeleMed has been implemented on several software platforms. These include Sun Solaris 2.x, Silicon Graphics IRIX 5.x, and Windows NT 3.5x and 4.0.

References

[1] Forslund, D, Phillips, R, Kilman, D, Cook, J, Experiences with a Distributed Patient Record System, submitted to 1996 AMIA Annual Fall Symposium.